

Investigation

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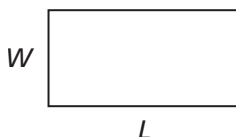
Equivalent Expressions

When you want to communicate an idea in words, you can usually express it in many ways. All the statements below communicate the same information about Mika and Jim.

- Jim is older than Mika.
- Mika is younger than Jim.
- Jim was born before Mika.
- Mika was born after Jim.

Can you think of other ways to express the same idea?

Symbolic expressions, formulas, and equations are valuable tools in mathematics. The formula $P = 2L + 2W$ gives directions for calculating the perimeter of any rectangle with length L and width W .



Since you can usually think about a situation in more than one way, you can often express the situation in symbols in more than one way.

Getting Ready for Problem 1.1

Jim says the perimeter of the rectangle above is $P = 2(L + W)$. Mika says the perimeter is $P = 2L + 2W$.

- Why do you think Jim used parentheses in his equation?
- Are the expressions $2L + 2W$ and $2(L + W)$ *equivalent*? Do they produce the same perimeter for any given pair of lengths and widths? Explain your reasoning.

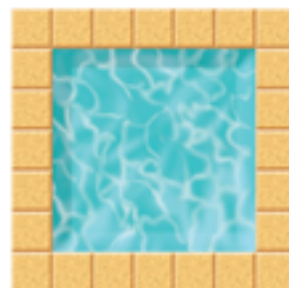


Since $2(L + W)$ and $2L + 2W$ represent the same quantity (the perimeter of a rectangle), they are **equivalent expressions**. This investigation explores situations in which a quantity is described with several different, but equivalent, expressions. The question is:

How can we determine if two expressions are equivalent?

1.1 Tiling Pools

In-ground pools are often surrounded by borders of tiles. The Custom Pool Company gets orders for square pools of different sizes. For example, the pool at the right has side lengths of 5 feet and is surrounded by square border tiles. All Custom Pool border tiles measure 1 foot on each side.

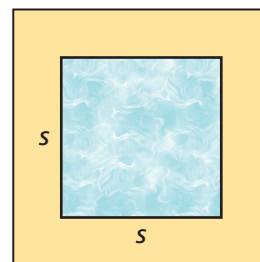



- How many border tiles do you need to surround a square pool?

Problem 1.1 Writing Equivalent Expressions

In order to calculate the number of tiles needed for a project, the Custom Pool manager wants an equation relating the number of border tiles to the size of the pool.

- A. 1.** Write an expression for the number of border tiles N based on the side length s of a square pool.
- 2.** Write a different but equivalent expression for the number of tiles N needed to surround such a square pool.
- 3.** Explain why your two expressions for the number of border tiles are equivalent.



 1 ft
1 ft
border tile

- B. 1.** Use each expression in Question A to write an equation for the number of border tiles N . Make a table and a graph for each equation.
- 2.** Based on your table and graph, are the two expressions for the number of border tiles in Question A equivalent? Explain.
- C.** Is the relationship between the side length of the pool and the number of border tiles linear, exponential, quadratic, or none of these? Explain.

ACE Homework starts on page 12.